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Complete Specification entitled (54) IMPROVEMENTS IN AND RELATING TO STRAND TWISTING APPARATUS

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Applicant (71) COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION

Actual Inventor (72) DAVID ERNEST HENSHAW

Related Art (56)

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|---|---|
| 25260/71 | 40.7 |
| 288664 (51009/64) | 40.7; 60.2; 60.3 |
| 260092 (10441/64) | 40.7 |

The following statement is a full description of this invention, including the best method of performing it known to us :

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F. D. Atkinson, Government Printer, Canberra

X658-76-2D-14P.C.

25258/71

This invention relates to reciprocating roller twisting apparatus of the general type disclosed in Australian Patent No. 288,664, i.e. apparatus comprising a pair of oppositely rotated and transversely reciprocated nip rollers.

One of the principal practical problems which has been encountered in the operation of the particular forms of apparatus described in Patent No. 288,664 is that the spacing between the twisting rollers must be accurately controlled if the best results are to be obtained. Our copending Australian patent application entitled "Roller Twisting Apparatus" discloses an improved form of apparatus which eliminates the need for gap adjustment by the operator during running. In this improved apparatus one of the rollers is mounted for movement toward and away from the other roller and biasing means is provided to bias that roller toward the other roller with a predetermined biasing force. It has been found that such apparatus can provide remarkably constant short and long term stability of the amount of twist inserted by the rollers. However, one particular problem has arisen in cases where apparatus which is normally driven at high speed is "inched" at low speed during threading operations following end breaks and during doffing. It has been found that the twisting efficiency of the rollers increases with decreasing speed of operation so that the twist levels imparted during "inching" will be much higher than those imparted during high speed running, with resultant irregularities in the yarn. The present invention

455170

provides an improvement whereby this problem is overcome.

According to the invention there is provided strand twisting apparatus comprising a pair of rollers arranged to form a nip between them and roller drive means to rotate the rollers so as to feed a strand through the nip and to reciprocate the rollers in opposite phase transversely of the strand feed direction, wherein one of said rollers is mounted for movement toward and away from the other roller and there is provided biasing means to bias said one roller toward said other roller with a predetermined force and bias relieving means conditionable to reduce the bias of the top roller to a force which is less than said predetermined force.

Preferably said one roller is disposed over said other roller and is mounted so as to be swingable up and down about a pivot axis parallel to its axis of rotation and counter-balancing means is provided to oppose the moment about the pivot axis due to the weight of the roller and its mounting.

The biasing means may comprise a weight system having a movable weight which is raisable by the relieving means to provide the bias relief.

In order that the invention may be more fully explained, one particular embodiment thereof will now be described in some detail with reference to the accompanying drawings, in which:-

Figures 1 and 2 are contiguous on the line X-X and together form a partly sectioned, schematic side elevation of apparatus constructed in accordance with the invention; and

Figure 3 is a partly sectioned end elevation of the apparatus.

The illustrated apparatus comprises upper and lower hollow rollers 1, 2 which form a nip 3. Lower roller 2 is mounted on two air bearings 4 formed at the ends of a pair of mandrels 6 which are mounted on a frame 7. The construction and operation of the air bearings, and the manner in which they are supplied with air through manifolds in the mandrels, is fully described in our co-pending Patent Application No. 25261/71 entitled "Roller Support Means for Roller Twisting Apparatus" and plays no part in the present invention. The drive connection to roller 2 is by means of a connecting rod 8 which is connected at its outer end to a rotating and reciprocating drive (not shown). The inner end of connecting rod 8 is attached to a mounting piece 9 which is in turn attached to the interior of the roller. The connection between the connecting rod and the connecting piece is by means of a rubber bush 11 which absorbs vibration and compensates for any misalignment between the axis of the connecting rod and the axis of the roller.

Roller 1 is mounted by means of air bearings on a pair of mandrels 12 carried by a yoke frame 13 which is pivotally mounted on a pair of pivot pegs 14A, 15A which extend from ends of pins 14, 15 clamped to frame 7. The air bearings supporting the roller 1 on mandrels 12 are similar to those supporting the lower roller 2, being supplied with air through manifolds

in the respective mandrels, and they are not detailed in the drawings. Pins 14, 15 are held within clamping sockets in frame 7 and the end pegs 14A, 15A project into ball races 16 fitted into bores 17 formed in yoke frame 13. Peg 14A is eccentric to the pin 14 whereas peg 15A is concentric with pin 15. The eccentricity of peg 14A enables roller 1 to be adjusted relative to roller 2 by the angular adjustment of pin 14 such that the vertical spacing between the roller axes is constant throughout the lengths of the rollers. Pin 15 is given a 20 lb. axial preload to minimise fretting corrosion in ball races 16. Roller 1 is connected to a rotating and reciprocating drive by means of a connecting rod (not shown) which is similar to that for roller 2. The two drive mechanisms are powered by a common electric drive motor. The motor has two speeds - a fast speed for normal running of the apparatus and a low speed for "inching" during threading operations.

At one end of the apparatus, a counter-weight 18 is fastened to yoke frame 13 by means of a bent stud 19 which extends through an opening 20 in frame 13 and is fitted with a pair of adjustment nuts 21. By appropriate re-positioning of nuts 21 on stud 19, the moment of the counter-weight about the axis of pivot pegs 14A, 15A can be adjusted. A locating dowel 22 on frame 13 is able to slide within an opening 23 in the counter-weight during this adjustment. The pivoted assembly of counter-weight 18, frame 13 and roller 1 is damped by a dashpot comprised of a

chamber 24 which is formed in frame 7 and is charged with a viscous damping medium and a plunger 26 which is fastened to the counter-weight and projects into the dampening medium. The dampening medium can be a silicone oil of suitable viscosity.

In use of the apparatus, counter-weight 18 is adjusted so that the upper roller assembly is completely balanced about pivot pins 14, 15 and the upper roller is biased toward the lower roller by means of the weight system 30 shown in Figure 3, which system is designed so that the loading of the top roller can be relieved to provide a predetermined lower biasing force.

System 30 comprises a weighted rod 31 which is suspended from a peg 28A fixed to yoke frame 13. Rod 31 has a pair of upwardly facing abutments 32, 33 and carries a pair of weights 34, 35. Weight 34 rests on abutment 32 and weight 35 rests on abutment 33 when a solenoid 36 is energised to pull a spring-loaded lifting yoke 37 downwardly against the influence of its loading spring 38. During normal high speed running of the apparatus solenoid 36 is energised so that weight 35 rests on abutment 33 and acts together with weight 34 to bias top roller 1 downwardly. When in this condition the system 30 biases the top roller downwardly with a force in the range 4 to 30 ounces. With such a light loading there is an effective gap between the rollers during operation and, because of the counter-weight balancing, this gap is independent of vibration of the machine in the

vertical direction. Additionally, the dashpot eliminates high frequency gap vibration but allows the top roller position to drift so as to maintain a constant loading.

The twisting efficiency of the rollers is dependent on the loading of the top roller toward the bottom roller and the speed of operation. The twisting efficiency increases with increased roller loading and with decreasing speed of operation. Thus if the loading of the roller were to remain unchanged when the rollers were being "inched" at slow speed, much higher levels of twist would be imparted than during normal high speed operation. However, during inching the loading of the top roller is relieved to such a degree that reasonably regular twist levels are maintained. The roller bias relief is achieved by de-energising solenoid 36 so that yoke 37 rises to lift weight 35 from abutment 33. Solenoid 36 can be connected into an electrical circuit with switches controlling operation of the drive motor so that it is automatically energised during normal running and de-energised during inching. Weights 34, 35 are chosen to accord with the normal speed of operation and the inching speed.

The illustrated apparatus has been advanced by way of example only and many modifications are possible. For example, instead of providing a counter-weight the weight of the top roller assembly could be supported on tension springs and the required loading of the top roller toward the bottom roller could be applied

by weights resting directly on it. Furthermore, such an arrangement could be designed without the pivots, the vertical movement of the roller being constrained by guides. It is accordingly to be understood that the invention is in no way limited to the specific constructional details described herein but includes many modifications within the scope of the appended claims.

The claims defining the invention are as follows:-

1. Strand twisting apparatus comprising a pair of rollers arranged to form a nip between them and roller drive means to rotate the rollers so as to feed a strand through the nip and to reciprocate the rollers in opposite phase transversely of the strand feed direction, wherein one of said rollers is mounted for movement toward and away from the other roller and there is provided biasing means to bias said one roller toward said other roller with a predetermined force and bias relieving means conditionable to reduce the bias of the top roller to a force which is less than said predetermined force.

2. Apparatus as claimed in claim 1, wherein the biasing means comprises a weight system having a movable weight which is raisable by the relieving means to provide the bias relief.

3. Apparatus as claimed in claim 2, wherein the weight system comprises a weight support member normally supporting the weight in an assembly the weight of which determines the predetermined biasing force and the relieving means is operable to raise and support the weight.

4. Apparatus as claimed in any one of the preceding claims wherein the rollers are generally horizontal, said one roller is disposed over the other roller and is rotatably mounted on a frame which is movable up and down with respect to the other roller, and there is means to counteract the weight of the frame and said

one roller.

5. Apparatus as claimed in claim 3 and claim 4, wherein the weight support member is supported directly by the frame.

6. Apparatus as claimed in claim 5, wherein the weight support member is elongate and is suspended from the frame.

7. Apparatus as claimed in any one of the preceding claims, wherein the drive means is electrically powered and is operable at two differing speeds and relieving means is electrically responsive and is electrically connected with the drive means so that said one roller is biased with the predetermined force when the drive means is operated at the higher of the two speeds and with the lesser force when the drive means is operated at the lower of the two speeds.

8. Apparatus as claimed in claim 7, wherein the relieving means comprises an electric solenoid.

9. Apparatus as claimed in any one of the preceding claims, wherein said predetermined biasing force is not greater than 30 ounces.

Dated this 8th day of February, 1971.

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL
RESEARCH ORGANIZATION
by its Patent Attorneys
DAVIES & COLLISON

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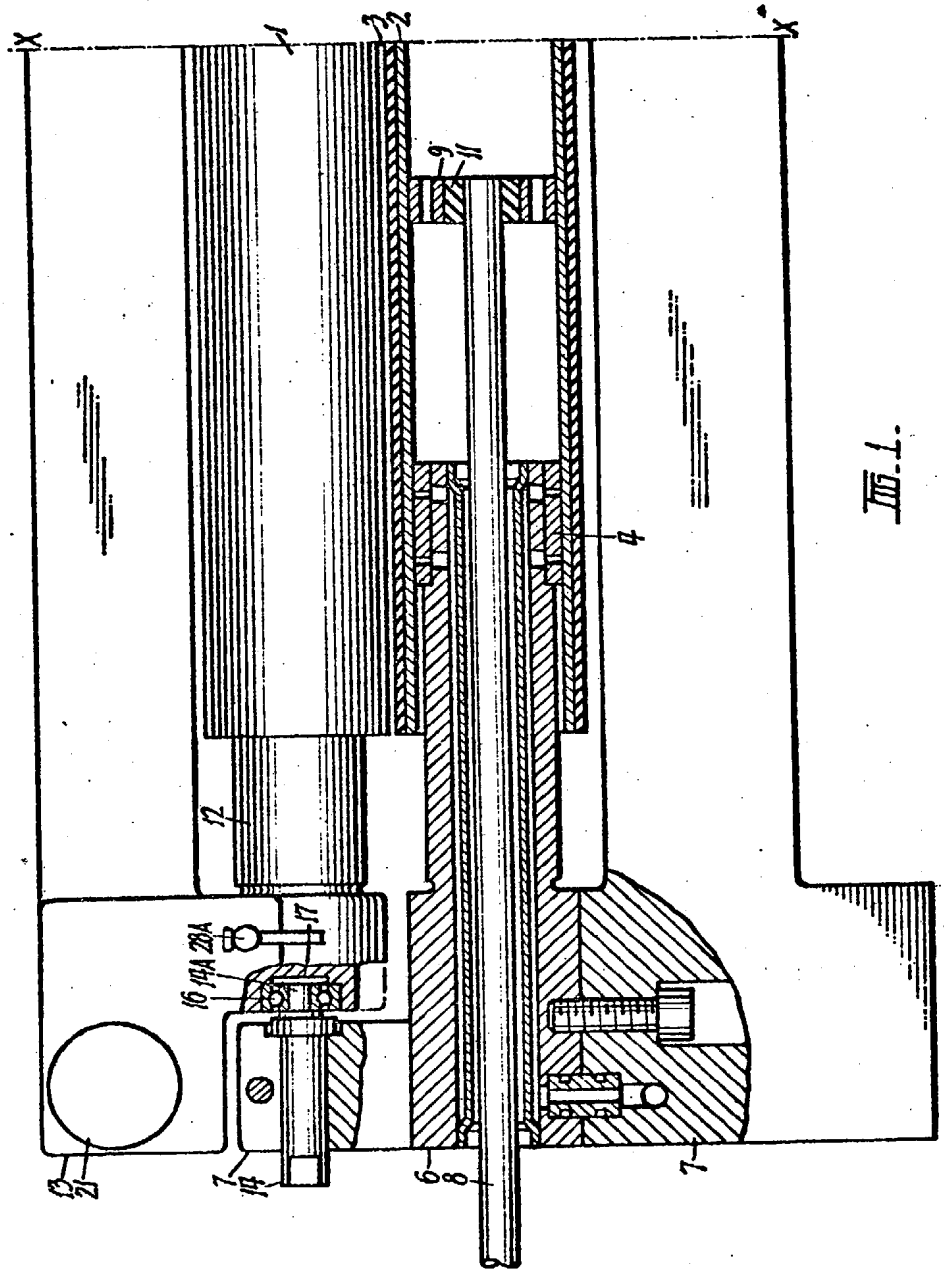


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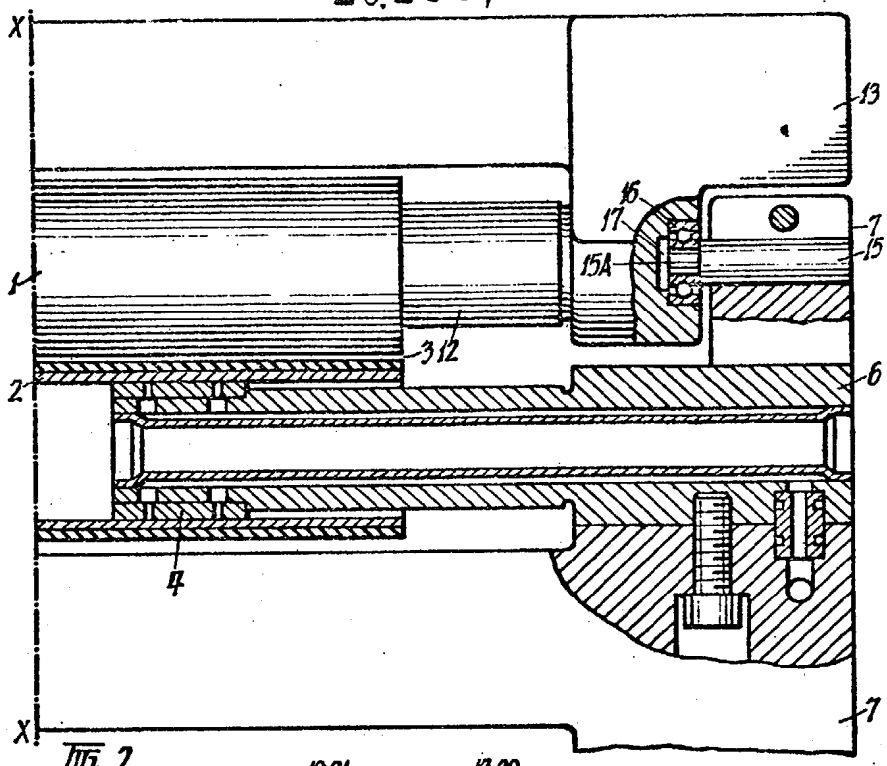
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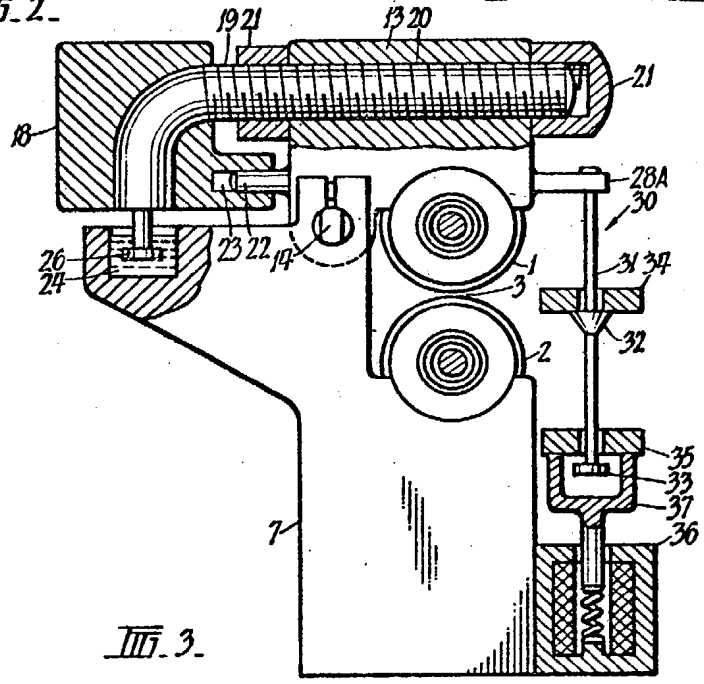
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Фиг. 3

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